Sudbury Neutrino Observatory - PMT Support Structure & Photomultiplier Tube Array

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The Sudbury Neutrino Observatory[1,2] (SNO) is a next-generation Čerenkov solar neutrino detector being constructed by a collaboration of twelve institutions from Canada, England, and the United States. It is located 2 *km* below ground near Sudbury, Ontario Canada in an active nickel mine operated by INCO, Ltd. The array of 9456 PMTs, viewing the 1000 *tonne* D_2O target, will detect ~ ten charged current solar neutrino events per day. The detector has sensitivity to the total neutrino flux, ν_x, independent of neutrino family (x= e, μ, τ) and to the ν_e flux, separately, by measuring charged and neutral current reactions and neutrino-electron elastic scattering.

This year the SNO collaboration celebrated the completion of two major milestones in the construction of the SNO detector. After more than two years of complex assembly the heavy water containment vessel (the Acrylic Vessel) was completed in December 1997. This permitted the Berkeley Group to complete the installation of their principal contribution to the SNO project - the PMT Support Structure and the PMT array - in January 1998. This array of 8 inch Hamamatsu PMTs was installed without the breakage of a single PMT. The installation of the geodesic structure and the PMT array was accomplished by the Berkeley team several weeks ahead of the original forecast duration and within budget.

With these construction activities completed the movement of SNO's D_2O underground has started and the installation of the electronics and data acquisition system proceed in parallel with the final phases of detector construction.

The anchor system designed to keep the PMT array in place after the cavity is filled with water has been installed.

The Berkeley group installed an array of pulsed blue LEDs on the geodesic sphere to aid the calibration of the detector.

The experiment is sensitive to uranium and thorium contamination on and in the detector components. These elements and their decay daughters produce signals that limit the energy threshold of the experiment. To restrict these backgrounds SNO undertook a thorough program to measure and control the intrinsic contamination in all the detector elements and to limit the contamination which could deposit on the detector elements at all stages of fabrication and installation. Constructing the PMT Support Structure, as well as the entire laboratory, under these clean room conditions and maintaining strict control of all the components used in the detector significantly complicated the fabrication and assembly of the detector.

Using the LBL LED system, ^{16}N source, and other calibration sources we have started to task of studying and calibrating the detector in February 1998. We anticipate the operation of the full PMT array under "air fill" conditions to observe Čerenkov light emitted by cosmic ray interactions in the air and acrylic during the four months required to fill the detector. Detector water fill will begin in the Spring of 1998.

Footnotes and References

†Die Arbeit wurde mit Unterstützung eines Stipendiums im Rahmen des Gemeinsamen Hochschulsonder-programms III von Bund and Ländern über den DAAD ermöglicht.

1. G. Ewan, *et al.* Sudbury Neutrino Observatory Proposal, SNO 87-12 (1987).

2. D. Cowen, *et al.* The Sudbury Neutrino Observatory, *to be submitted to NIM*.